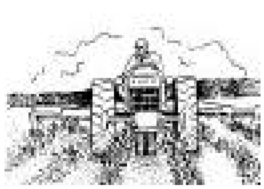
Spring 2000 **Technical Update #4**

Eastern Gamagrass
for Forage, Soil Improvement, and Buffer Strips

Project Activities

1. This summer the Pasture Focus Group will target supporting the seven producers that seeded eastern gamagrass last year. Due to various environmental factors, there was a poor response to stand establishment. Therefore, efforts will be made to reseed at these sites this season. Several new sites are being investigated. Funding for these projects has been adequate and is satisfactory with the producers. For further information, contact Don Schwartz, ds23@umail.umd.edu.

2. The 2nd Annual Eastern Native Grass Symposium was held in Baltimore, MD on Nov. 17-19, 1999. Hosts included the Natural Resources Conservation Service (NRCS) Plant Materials Program, the Agriculture Research Service (ARS), and the National Association of Conservation Districts (NACD). Over 300 participants exchanged information promoting native species use. 70 presentation topics included the history of native grasses, native grass establishment and management, wildlife values, forage production, and eastern gamagrass. ARS and NRCS published the proceedings in May. The web site to access the proceedings: http://www.nhq.nrcs.usda.gov/BCS/PMC/eng/eng.html



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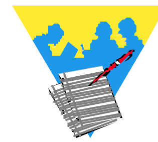

Research in Progress:

Eastern Gamagrass: Determining its Feasibility as a Forage Crop for the Northeast by Paul Salon

A SARE grant, “Eastern Gamagrass: Determining its Feasibility as a Forage Crop for the Northeast” is being conducted by the USDA-NRCS Big Flats Plant Materials Center with cooperation by Cornell University, Morrisville and Cobleskill agriculture & technical Colleges.

Eastern gamagrass cv ‘Pete’ was established on 12 different sites including 8 farms and 4 teaching and/or research facilities within 9 counties in New York State. Companion plantings of oats and 5 legumes were established in sub plots at all sites immediately following cultivation at the end of July to early August of the establishment year. These companion crops are used to reduce erosion, increase production and forage quality and to reduce frost heaving and weed problems.

A forage quality study was conducted for two years evaluating the effects of harvest management on ‘Pete’ eastern gamagrass. Three 1st cutting dates and 3 second cutting intervals were evaluated. An additional study evaluated the forage quality of reproductive and vegetative tillers of six gamagrass accessions. The forage quality data will be published in the proceedings of the 2nd eastern native grass symposium held in Baltimore Md. 11/17-19, 1999.

Three animal feeding trials evaluating milk production will be conducted comparing a ration based on 50% corn silage to one based on 50% gamagrass silage and balanced for CP and NDF.

For more information, contact Paul Salon, Research Agronomist, USDA-NRCS, Big Flats Plant Materials Center, Box 3266A, State R. 352, Corning, NY 14830, 607-562-8404.

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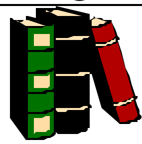

Research Abstracts

1. Comparative Germination of 1998 and 1999 Lots of Germtec II™ Treated Eastern Gamagrass Seed after 28 Days in the Greenhouse and Laboratory

Donald T. Krizek[1], Mary J. Camp[2], Susan R. Maxon[3], Gwen C. Meyer[4], Jerry C. Ritchie[5], Kathleen M. Davis[4], and Miguel L. McCloud[1]

Preliminary greenhouse studies conducted in 1998 indicated that Germtec II™ primed seed of eastern gamagrass [*Tripsacum dactyloides* (L.) L.] kept at 4°C showed a decline in germination within 2 months after receiving the seed. The experiment was repeated during 1999 in greenhouses using both 1998 and 1999 seed lots. Three trays of 100 seeds each from both lots were planted at each location every 4 weeks from March 17 to September 2, 1999. Three germination tests were also conducted on identical dates in April, July, and September in a germinator at a day/night temperature of 30/20°C (8 h photoperiod), using 8 replicates of 50 seeds each.

Results indicated that overall there was no significant difference in initial percentage germination in the greenhouse between the two seed lots, but that over time, there were significant differences. Both groups showed a similar pattern, with high initial percentage germination and then a gradual decline. The average 28 d percentage germination values in the greenhouses for the two seed lots on April 14, May 12, June 9, July 7, August 5, September 2 and September 30, 1999 were 65%, 38%, 44%, 31%, 34%, 37%, and 37%, respectively. The comparable 28 day percentage germination values in laboratory tests on May 12, July 7, and September 30 were 67%, 66% (plus 7% dormant), and 64% (plus 7% dormant), respectively, for the 1998 seed lot and 76%, 72% (plus 11% dormant), and 67% (plus 11% dormant), respectively for the 1999 seed lot. Tetrazolium chloride tests indicated that the 1998 seed lot had a significantly greater percentage of dead seed than the 1999 seed lot.

The decline in germination of Germtec II™ treated seed in both seed lots in 1999 is consistent with the pattern observed in 1998 and suggests that: (1) the stimulatory effects of this treatment are relatively short-lasting; and (2) secondary dormancy may be induced during late spring, and this dormancy may be broken during subsequent cold storage. The 5-10% variation in percentage germination of this species at any one date is consistent with previous observations made by NRCS researchers in Kansas over a 25-year period.

(pp. 182-193. In: Ritchie, J.C., J.A. Dickerson, and C.A. Ritchie (eds.), Proceedings of the Second Eastern Native Grass Symposium: Baltimore, MD November 17-19, 1999. Published by USDA, Agricultural Research Service and USDA-Natural Resources Conservation Service. Beltsville, MD. ARS Hydrology Laboratory Occasional Paper #2000-1. 2000)

2. Native Warm-Season Grass Establishment as Affected by Weed Control in the Maryland Coastal Plain

Gwen C. Meyer[2], Norman C. Melvin III,[2] Thomas R. Turner[3], and Harry J. Swartz[3]

There are numerous warm-season grass (WSG) species native to the Mid-Atlantic Coastal Plain of Maryland. However, few regional species are commercially available and little research has focused on their successful direct seeding establishment. Reliable establishment research procedures for native WSG species will promote their use in ecological restoration, soil conservation, and summer pastures of the region.

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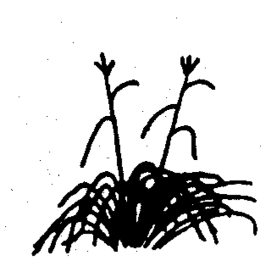
Because weed control is often critical to WSG establishment, our objective was to evaluate the effect of four weed control practices on establishment of beaked panicum [*Panicum anceps* Michx.], purpletop [*Tridens flavus* (L.) Hitchc.], and Indiangrass [*Sorghastrum nutans* (L.) Nash] collected in the Mid-Atlantic Coastal Plain.

Treatments used for 2-yr establishment study at two sites were 1) infrequent mowing regime (once per season), 2) frequent mowing regime, 3) frequent mowing in the first year with a broadleaf herbicide mixture (2,4-D, MCPP, and Dicamba) applied in the second year, 4) frequent mowing in the first year with an imidazolinone herbicide applied in the second year, and 5) a control. Stand density (m^2) was recorded in September of the seeding year and monthly from June through September during the second growing season at both research sites. Indiangrass averaged a minimum stand density of 11 or more plants m^{-2} with all weed control practices including the control.

Results indicate that all weed control treatments produced significantly higher stand densities as well as higher tiller numbers than the control. Therefore, even minimal weed control, such as one mowing per season, significantly reduced weed competition improving WSG stand establishment in the Mid-Atlantic Coastal Plain over two growing seasons for the species tested.

(pp. 212-221. In: Ritchie, J.C., J.A. Dickerson, and C.A. Ritchie (eds.), Proceedings of the Second Eastern Native Grass Symposium: Baltimore, MD November 17-19, 1999. Published by USDA, Agricultural Research Service and USDA-Natural Resources Conservation Service, Beltsville, MD. ARS Hydrology Laboratory Occasional Paper #2000-1. 2000)



3. Comparative Biomass, Composition, and Forage Quality of Greenhouse-grown Gamagrass Plants Differing in Age, Stage of Development, and Drought Tolerance

James B. Reeves, III[3], Donald T. Krizek[2], Charles D. Foy[2], and Jerry C. Ritchie[3]

The primary objective of this work was to evaluate the biomass, composition, and forage quality of eastern gamagrass [*Tripsacum dactyloides* (L.) L.] differing in age, stage of development, and drought tolerance. Young plants were established in the greenhouse from seed. Also 2-year old plants selected from field plots for drought tolerance (DT) or drought sensitivity (DS) in Nov 1997 were transplanted into the greenhouse. Six samples of 15 young plants each were cut back to 25 cm at 80, 94, 108, 122, 147, 164, and 185 days from seeding. Three DT and three DS plants each were treated as above with regrowth harvested at 94, 108, and 122 days.

Samples from each harvest were analyzed for neutral detergent fiber (NDF), acid detergent fiber (ADF), lignin, and crude protein (CP). The Least Significant Difference test was used to evaluate differences in composition, biomass, and drought tolerance over time. While little variation in NDF with age was found in young plants, DS plants had significantly higher NDF than DT plants regardless of age.

Greater variations were found for ADF, lignin, and CP with age for young plants and for ADF, but not for lignin or CP, for the DT and DS plants. Also, DT plants generally had lower lignin content than DS plants regardless of age. Finally, biomass for young plants differed significantly with age, increasing to day 218, then decreasing. Biomass of DS plants was generally greater than DT plants of the same age.

These results show that gamagrass displays complex variations in composition and thus forage quality during aging and in selected genotypes differing in drought tolerance. Overall, forage quality was excellent with CP ranging from 15-18%. Plants were also high in fiber with NDF, ADF, and lignin ranging from 77-85%, 38-43%, and 2.9 to 4.7%, respectively.

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4. Vegetative Propagation of Eastern Gamagrass: Effects of Root Pruning and Growth Media

Errol G. Rhoden[4], Jerry C. Ritchie[2], Donald T. Krizek[3] and Charles D. Foy[3]

Eastern gamagrass [*Tripsacum dactyloides* (L.) L.] is currently being investigated as an alternative forage crop as well as a grass hedge against erosion. Methods of vegetatively propagating this crop are being explored in order to obtain cloned planting material.

A 16-week greenhouse study (07/31/98-11/30/98) was conducted at the Agricultural Research Service facilities in Beltsville, MD to determine the minimal number of roots and the type of growth media needed for the successful propagation of 'Pete' eastern gamagrass. The treatments consisted of four growth media (Jiffy mix, a composted soil, Tatum clay loam and Turface) as the main effect, and severity of root pruning (one, two, three or four roots remaining on the culm) as sub-plot in a split plot design with three replicates.

Overall, plant survival rate ranged from 16.7% in the composted soil to 75.0% for Tatum clay loam. Of those plants surviving the transplant process, tiller number, plant height, and foliage dry weights were greatest for plants grown in Jiffy mix. Foliage dry weights for plants grown in Tatum clay loam, Turface, composted soil and Jiffy mix averaged 3.9, 12.3, 23.8 and 34.2 g/plant, respectively. Root dry weight averaged 1.9 g/plant for Tatum clay loam to 13.4 g/plant for Jiffy mix. Shoot-root ratio ranged from 3.6 in Turface to 1.7 for plants grown in composted soil. The number of roots left on the transplanted culms had no effect on the shoot-root ratio of eastern gamagrass.

Although eastern gamagrass plants grown in Tatum clay loam had the highest survival rates, these plants were the shortest, had the lowest plant dry weights, and the fewest number of tillers. After 16 weeks, plants obtained from culms with 2 or 3 roots transplanted into Jiffy mix had the overall best appearance of all root pruning/growth media treatments. It is feasible to vegetatively increase eastern gamagrass by transplanting a minimum of crown tissue into a porous, well-aerated growth medium.

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5. Influence of Root Removal on Shoot Regrowth and Forage Quality of Greenhouse-Grown Eastern Gamagrass

Errol G. Rhoden[5], James B. Reeves, III[2], Donald Krizek[3], Jerry C. Ritchie[4], and Charles D. Foy[3]

This study was conducted to determine the influence of root removal on shoot regrowth, composition, and forage quality of greenhouse-grown eastern gamagrass plants. On 27 July 1998, the root mass of 5-month old plants was pruned 25% or 50%, or left uncut and the plants were transferred to 20-cm diameter pots having a depth of 40 cm. Plants were grown in a peat-vermiculite mix and fertilized weekly. Shoots were clipped to 25 cm on 18 August (H1), 16 September (H2), 7 October (H3), and 28 October (H4).

For each harvest, height and total biomass measurements were taken on shoot regrowth and samples were analyzed for neutral detergent fiber

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(NDF), acid detergent fiber (ADF), lignin, crude protein (CP), dry matter digestibility (DMD), and cell wall digestibility (CWD). Plants were vegetative at H1 and H2, in flower by H3, and starting to become dormant by H4. Trimming roots of eastern gamagrass plants at the time of transplanting had a negative effect on subsequent regrowth of shoots, particularly when 50% of the roots were removed. This was generally reflected in an increase in the number of senescent leaves, a decrease in the number of tillers and in a reduction in the dry weight of forage collected. Despite these reductions in vegetative growth, there was little or no effect of root removal or date of harvest on forage composition or quality.

Root removal had no significant effect on NDF or ADF and little or no effect on DMD or CWD at H1-H4. Content of lignin and CP was variable, depending on the extent of root removal and the date of harvest. CP content of the forage samples ranged from 14% to nearly 20% which is higher than that typically reported for field-grown eastern gamagrass plants. The ability of eastern gamagrass plants to cope with the stress of root pruning without altering the quality of forage demonstrates the resilience of this species for adapting to adverse environmental conditions.

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6. Grass Hedges for Erosion Control

Jerry C. Ritchie[6], W. Doral Kemper[2], John M. Englert[3] and Donald T. Krizek[4]

Erosion is a major concern in agricultural areas around the world leading to soil loss, reduced soil productivity, and downstream offsite pollution. Grass hedges are widely used in the tropics to reduce soil loss, but few studies have produced quantitative data on these conservation practices. In studies at Beltsville, Maryland miscanthus [*Miscanthus sinensis* Andersson] and eastern gamagrass [*Tripsacum dactyloides* (L.) L] were used to establish grass hedges on the contour across swale areas. Quantitative data from these studies show that these narrow, stiff grass hedges act as filters to slow and broaden the water flow area, resulting in ponding that increases settling times for entrained material to be deposited in the low areas.

Deposition rates measured using field surveys in 1991, 1995, and 1998 were 1-2 cm yr^{-1} up slope from these hedges. These deposition areas in the swales further reduced the steepness of the slopes giving even larger areas for the water to spread and slow. Grass hedges can be an alternative conservation practice for reducing soil loss and dispersing runoff from areas of erosion in agricultural fields. However, grass hedges should not be seen as a panacea, but as another tool in the arsenal to control soil loss and runoff. Continued efforts to control soil loss at the point of detachment are critical.

The NRCS has developed a Conservation Practice Standard for using grass hedges for runoff and sediment control. While miscanthus is effective as a grass hedge, indigenous grasses (i.e., eastern gamagrass, switch grass [*Panicum virgatum* L.]) should be used when possible to reduce the potential for the introduction of exotic material into new environments.

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Eastern Gamagrass for Forage, Soil Improvement, and Buffer Strips

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Initial contacts concerning the project may be directed to the following persons, however the list of participants is much longer:

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